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On chip design in the KM3NeT experiment

The KM3NeT collaboration is building a large underwater neutrino telescope in the Mediterranean Sea. The detector operates by detecting Cherenkov light produced by the charged products of neutrino interactions in seawater. The detection is done by
digital optical modules (DOMs), which each house 31 3 inch photomultiplier tubes (PMTs). A custom, low power, PMT base was developed to provide the high voltage by means of a Cockroft-Walton (CW) multiplier circuit, and to amplify and pre-process the PMT signals. At the core of the base design are two ASIC's, which we will describe in this contribution:
1. PROMiS: A mixed signal ASIC which amplifies the PMT signal and provides digital information on LVDS lines to the central logic board in each DOM. The photon arrival time is provided with <2ns accuracy, while a time-over-threshold measurement encodes the pulse charge. Each chip is uniquely identified using a 24-bit one-time-programmable memory and communication with the chip is achieved using the I2C protocol.
2. CoCo: An analog ASIC which provides pulses to charge the CW circuit and controls the feedback of the high voltage.
Both ASICs have recently been produced and packaged in large numbers. Automated functional tests have been performed. The chips also went through Quality and Reliability tests. The paper will discuss the design, production challenges and the test results.

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